REMARKS

The Examiner's Action mailed on February 21, 2007, has been received and its contents carefully considered.

In this Amendment, Applicants have editorially amended the specification and claims 1 and 5-7. Claim 1 is the sole independent claim, and claims 1-7 remain pending in the application. For at least the following reasons, it is submitted that this application is in condition for allowance.

Claim 7 was objected to for an informality and has been amended accordingly. It is therefore respectfully requested that this objection be withdrawn.

Claims 1 and 2 were rejected under 35 USC §103(a) as obvious over the combination of *Egashira et al.* (JP 10-209897 A) with *Ireland* (US 3,474,453). This rejection is respectfully traversed.

Egashira et al. discloses in the preferred embodiments of Drawings 1 and 2 a tuning circuit **20**, made up of a parallel LC circuit shunted to ground, and an LC pi-section **30** connected between tuning circuit **20** and antenna **10**. A further inductor **31** is also connected between the pi-section **30** and the antenna **10**. As a parallel LC circuit exhibits a high impedance across its terminals at resonance, connecting such a tuning circuit **20** shunted to ground instead of in series results in a desired low impedance between the antenna **10** and the radio at resonance. Please note that the circuit **30** is described as an "LC series resonance circuit" although, as can be clearly seen from the drawings, it is in fact a series connected

pi-section circuit. As is well known in the art, a pi-section differs in behavior from a resonant circuit, such that instead of having an impedance null or peak at a resonant frequency it has a change between low and high impedance either side of a cut-off frequency. As the pi-section circuit **30** has shunt inductance (**35**, **36**) and series capacitance (**32**, **33**), it would inherently function as a high-pass filter, i.e. have a low impedance above a cut-off frequency, but at frequencies above cut-off it would also function as an impedance matching or transforming device, which is its function here. *Egashira et al.* operates on the principle that, by matching the impedance of the antenna **10** using the pi-section circuit **30**, the effective tuning range of the tuning circuit **20** is extended, and *Egashira et al.* also employs a single tuning voltage $\mathbf{V_T}$ to control both circuits. The inductor **31** is chosen to cancel the capacitive reactance at the center of the frequency band, and the inductor **43** in the embodiment of Drawing 3 is a loading coil as conventionally used with a physically short antenna.

Ireland, on the other hand, discloses an antenna with a parallel LC circuit connected in series therewith and either in the centre thereof, or at the base as in FIG. 5-8. The capacitor is mechanically adjustable, being physically realized by longitudinally movable conductive sleeve **53** surrounding coil **27**, and the inductance of the coil **27** may also be varied by adjusting threaded tuning slug **73**.

In the present invention, FIG. 1 represents an illustrative example in which an antenna **2** is tuned by adjusting a voltage controlled capacitor **122** (or **C**), which

together with an inductor **121** (or L_2) forms part of a parallel LC circuit **12** connected in series with the antenna **2**, and the frequency range that can be covered by varying the value of **C** is extended not merely by adding a further inductor **11** (or L_1) between the parallel LC circuit **12** and the antenna **2**, but also by meeting certain conditions. One of these conditions is that the combined reactance of the antenna **2** (having an inductance of L_a) and of the inductor **11** (having an inductance of L_1) cancels the combined reactance of the parallel circuit **12**, made up of L_2 (element **121**) and **C** (element **122**). This relation is expressed in the specification as equation (5), and in claim 1 as "the tuning circuit is set so that a combined reactance of the radiation element and the first inductance element and a combined reactance of the parallel circuit are canceled by each other".

In contrast, in *Egashira et al.*, the inductor **31** has a reactance that apparently cancels with the reactance of capacitors **32** and **33** of the circuit **30** in the middle of the frequency band. **30** is a matching circuit, not a tuning circuit, and is clearly a pi-section circuit not a parallel circuit as claimed (although **30** is referred to in the JPO English translation as "an LC series resonance circuit"). Further, there is no teaching or suggestion that a *combined* reactance of the antenna **10** *and* inductor **31** cancels with a *combined* reactance of capacitors **32**, **33** *and* inductors **35**, **36**.

Ireland also fails to teach any feature whereby a combined reactance of an antenna and of an inductor in series between the antenna and a tuning circuit cancels the total combined reactance of the tuning circuit.

Consequently, there is no teaching or suggestion either in *Egashira et al.* or in *Ireland*, whether taken separately or in combination, that "the tuning circuit is set so that a combined reactance of the radiation element and the first inductance element and a combined reactance of the parallel circuit are canceled by each other" as recited in claim 1.

The Office Action alleges that it would have been obvious to have employed a parallel tuning circuit connected in series with an antenna, as disclosed in *Ireland*, in place of the "LC series resonance circuit" of *Egashira et al.*, and that the present invention would result. However, assuming such a substitution were obvious, *Egashira et al.* still does not disclose the above recited condition of claim 1, and neither does *Ireland*.

Further, it would not have been obvious to one skilled in the art to have substituted a series connected parallel tuned circuit such as that shown by *Ireland* for circuit **30** of *Egashira et al.* Circuit **30** is not in fact a series resonance circuit as recited in the translation and the abstract, but is actually a series connected pi-section, but if, for sake of argument, it were a series connected series resonant circuit, it would have essentially opposite frequency characteristics from a series connected parallel tuned circuit such as taught in *Ireland*. Although moving the position of a tuned circuit from in series with the antenna to a position in shunt

therewith would make a series circuit behave like a parallel circuit and vicea versa, *both* references in fact show the respective circuits connected in series with the antenna. As circuit **30** is in point of fact a pi-section and not a tuned circuit, it differs further from a tuned circuit by having a cut-off frequency instead of a resonant frequency, as explained above.

Thus, claim 1 patentably defines over the combination of *Egashira et al.* with *Ireland*, and is allowable, together with claims 2-7 that depend therefrom.

Claim 3 was rejected under 35 USC §103(a) as obvious over the combination of *Egashira et al.* with *Ireland* and *Kanayama et al.* (US 5,861,859). This rejection is respectfully traversed.

Claim 3 depends from claim 1, and as *Kanayama et al.* fails to remedy the deficiencies of *Egashira et al.* and *Ireland* with respect to claim 1, is also allowable.

Claim 4 was rejected under 35 USC §103(a) as obvious over the combination of *Egashira et al.* with *Ireland*, *Kanayama et al.* and *Thompson* (US 6,433,749 B1). This rejection is respectfully traversed.

Claim 3 also depends from claim 1, and as *Kanayama et al.* and *Thompson* fail to remedy the deficiencies of *Egashira et al.* and *Ireland* with respect to claim 1, is also allowable.

Claims 5-7 were rejected under 35 USC §103(a) as obvious over the combination of *Egashira et al.* with *Ireland*, *Kanayama et al.* and *Makino* (US 5,446,469). This rejection is respectfully traversed.

Claims 5-7 also depend from claim 1, and as *Kanayama et al.* and *Makino* fail to remedy the deficiencies of *Egashira et al.* and *Ireland* with respect to claim 1, are also allowable.

It is submitted that this application is in condition for allowance. Such action and the passing of this case to issue are requested.

Should the Examiner feel that a conference would help to expedite the prosecution of this application, the Examiner is hereby invited to contact the undersigned counsel to arrange for such an interview.

Should any fee be required, however, the Commissioner is hereby authorized to charge the fee to our Deposit Account No. 18-0002, and advise us accordingly.

Respectfully submitted,

May 23, 2007
Date

Alun L. Palmer – Registration No. 47,838
RABIN & BERDO, PC – Customer No. 23995
Facsimile: 202-408-0924; 202-408-5297
Telephone: 202-371-8976

ALP/klc